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REPORT

From Consumers to Creators: AI-Driven Healthcare Innovation in Africa

Abstract

This project explores AI-driven mobile healthcare solutions tailored for Africa's remote regions, aiming to shift from digital consumerism to innovation. It highlights intelligent connectivity, biometric identification, and image-based triage as key applications.

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Introduction

In the growing and evolving landscape of technology, Africa is comfortable with being a consumer. This project is aimed at pivoting from consumerism to designing and developing digital services, showcasing the innovative capabilities of Africans in finding technological solutions to their own socio-economic problems.

In Africa where mobile phones are the most widespread computing devices, integrating AI capabilities into telecom infrastructure is essential for digital transformation, vitality management, and access to services.

Application Context

We will be focusing exclusively on mobile-to-healthcare provider AI functionalities. n remote regions, especially across Africa, patients often trek for hours seeking emergency care—only to face long waits and overwhelmed medical staff When a patient lives hours away from the nearest health service provider, there is a wide gap between patients and healthcare providers during emergencies leading to delayed diagnoses and missed lifesaving interventions. The challenge isn't always the absence of medical professionals, but the lack of accessible, situation-specific first aid guidance. This initiative aims to transform that reality through AI-enabled triage services delivered via mobile platforms. This domain is relevant in its own rite.

Representative AI-Powered Applications

Application Short	Description	Key Computational Tasks	Notes (Relevance)
Intelligent Connectivity	Connects the user to the nearest healthcare provider	Communication protocols, optimization	To alert the healthcare provider so they can assess the situation and make arrangements to receive the patient
Fingerprint Recognition	Pulls patient files using their fingerprint as an identifier	Pattern recognition, searching, arithmetic operations	Fingerprints are unique identifiers so they can be used to identify a patient and retrieve their medical history
Image Processing	Identifies region of harm, type of wound, and severity.	Arithmetic operations, inference, feature extraction, image capturing	The ability to visually assess the situation allows for diagnosis and first aid precautions

Workload Characteristics

a) Intelligent Connectivity involves two demanding workload components: geospatial computation and provider matching. Geospatial computation relies on the haversine formula to calculate proximity between coordinates, which becomes resource-intensive when scaled across large datasets. Provider matching requires dynamic filtering based on multiple attributes such as service type, physician specialization and user preferences. These operations demand high CPU throughput, memory bandwidth, and efficient indexing, making the system workload significantly heavy, especially under real-time constraints or high user concurrency.

b) Fingerprint Recognition is a lightweight workload with minimal computational demands. It typically involves simple pattern matching and ridge analysis, requiring negligible CPU cycles, low memory usage, and minimal I/O operations. The algorithm can execute in real time on constrained platforms such as microcontrollers or embedded IoT devices. Its suitability for low-power environments makes it ideal for biometric authentication in mobile and edge computing scenarios.

c) Image Processing using the SIFT (Scale-Invariant Feature Transform) algorithm is highly compute-intensive. It performs scale-space extrema detection and keypoint localization, which exponentially increases memory usage. The workload demands high GPU acceleration or multi-core CPUs, making it unsuitable for low-cost or resource-limited AI systems.

Initial Insights for Processor Design

- Processor design must support multithreading for Intelligent Connectivity's concurrent geospatial and provider-matching tasks.
- Lightweight fingerprint recognition demands ultra-low power modes and efficient sleep/wake cycles for IoT platforms.
- SIFT-based image processing requires fast memory access, large L2/L3 caches, and support for memory-intensive operations.
- Accurate geospatial and image computations need optimized FPUs and SIMD/vector extensions (e.g., AVX, NEON).
- To accommodate diverse workloads—from edge devices to cloud-scale systems—the architecture must be modular and scalable, enabling deployment across microcontrollers, mobile platforms, and high-performance CPUs or GPUs.

References

1. Njei, B. *et al.*, 2023. Artificial intelligence for healthcare in Africa: a scientometric analysis. *Health and Technology*, 13, pp.947–955. Available at: https://link.springer.com/article/10.1007/s12553-023-00786-8 [Accessed 23 Sep. 2025].

2. Oladipo, E.K. *et al.*, 2024. Impact and Challenges of Artificial Intelligence Integration in the African Health Sector: A Review. *Trends in Medical Research*, 19(1), pp.220–235. Available at: https://tmr.scione.com/cms/fulltext.php?id=144 [Accessed 23 Sep. 2025].

3. Andigema, A.S. *et al.*, 2024. Transforming African Healthcare with AI: Paving the Way for Improved Health Outcomes. *Journal of Collaborative Healthcare and Translational Medicine*, 7(1), Article 1046. Available at: https://www.jscimedcentral.com/jounal-article-info/Journal-of-Collaborative-Healthcare-and-Translational-Medicine/Transforming-African-Healthcare-with-AI:-Paving-the-Way-for-Improved-Health-Outcomes-11760 [Accessed 23 Sep. 2025].